

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education
Higher Tier
March 2012

Science B

SCB1HP

Unit 1 My World

H

Written Paper

Thursday 1 March 2012 1.30 pm to 2.30 pm

For this paper you must have:

- a ruler.
- You may use a calculator.

Time allowed

- 1 hour

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 3 should be answered in continuous prose. In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.



M A R 1 2 S C B 1 H P 0 1

Answer **all** questions in the spaces provided.

1 Animals and plants are adapted to live in their environment.

1 (a) The photograph shows a polar bear, which lives in the Arctic, where it is very cold.



Explain how thick fur helps a polar bear to keep warm in cold conditions.

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(3 marks)



1 (b) The table gives some data about the surface area to volume ratio for some animals.

Animal	Surface area to volume ratio
A	6:1
B	5:1
C	8:1

Which animal, **A**, **B** or **C**, do you think would survive best in cold conditions?

Explain why.

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(3 marks)

1 (c) Complete the sentences.

Some microbes live in very extreme environments like the Arctic.

Microbes like these are called

These types of microbe can also be found in very dry environments and
around vents.

(2 marks)

8

Turn over for the next question

Turn over ►



2 (a) Some students decided to investigate the chemistry of calcium carbonate.

The students started by adding hydrochloric acid to some pieces of calcium carbonate. The mixture fizzed and released a gas.

How could the students test to find out if the gas is carbon dioxide?

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(2 marks)

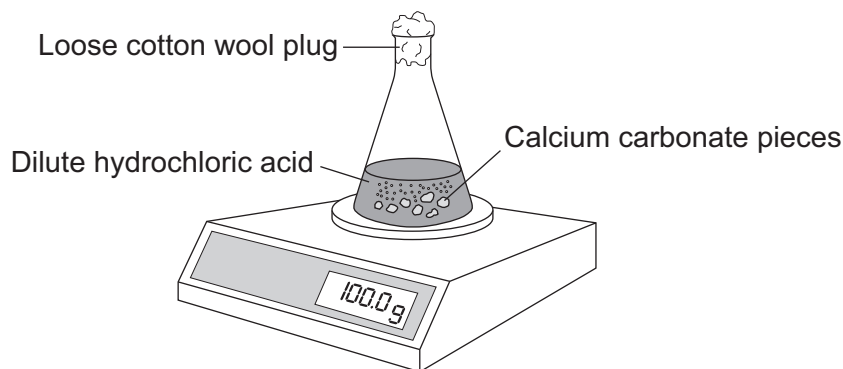
2 (b) The word equation for the reaction between calcium carbonate and hydrochloric acid is:

calcium carbonate + hydrochloric acid \longrightarrow calcium chloride + water + carbon dioxide

The students did an experiment to measure the mass change during the reaction of calcium carbonate and hydrochloric acid.

They measured the mass change every minute for 7 minutes.

They used the apparatus shown in the diagram.



2 (b) (i) Suggest why the flask is loosely plugged with cotton wool.

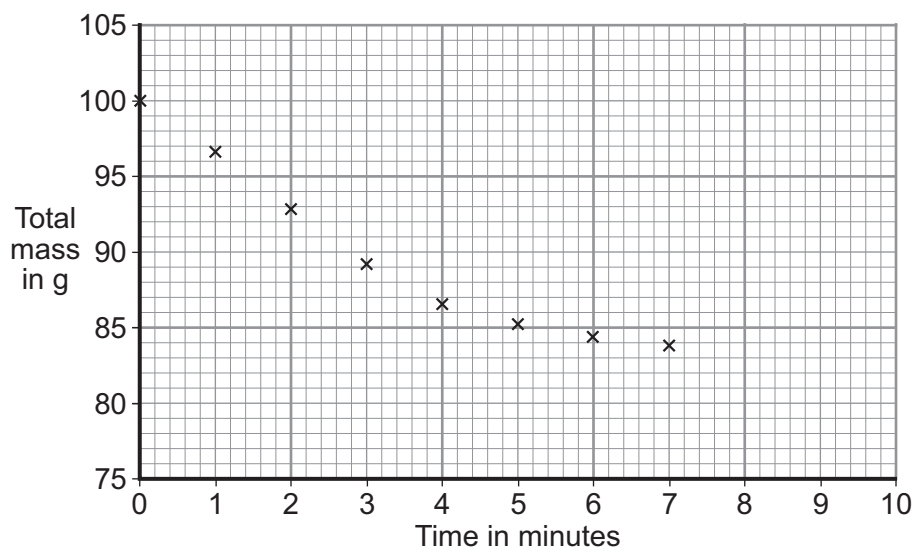
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(1 mark)



The students plotted the results of their experiment on the graph shown below.



2 (b) (ii) On the graph, draw a line of best fit.

(1 mark)

2 (b) (iii) Use the graph to suggest when the reaction will be complete, and explain why you can't be sure.

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(2 marks)

2 (b) (iv) Explain why the mass changes during the reaction.

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(2 marks)

Turn over ►



- 2 (c) (i)** In another experiment the students heated some powdered calcium carbonate strongly. The calcium carbonate decomposed to produce calcium oxide and carbon dioxide. Write the symbol equation for this reaction.

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(2 marks)

- 2 (c) (ii)** The students heated 5 g of calcium carbonate until it had all decomposed.

They collected the gas produced in a gas absorber.

At the start of the experiment, the gas absorber weighed 25 g. At the end of the experiment, the gas absorber weighed 27.2 g.

What mass of calcium oxide was produced?

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Mass of calcium oxide produced = g
(2 marks)

- 2 (c) (iii)** Give the name of the law you used when calculating the mass of calcium oxide in part (c)(ii).

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(1 mark)

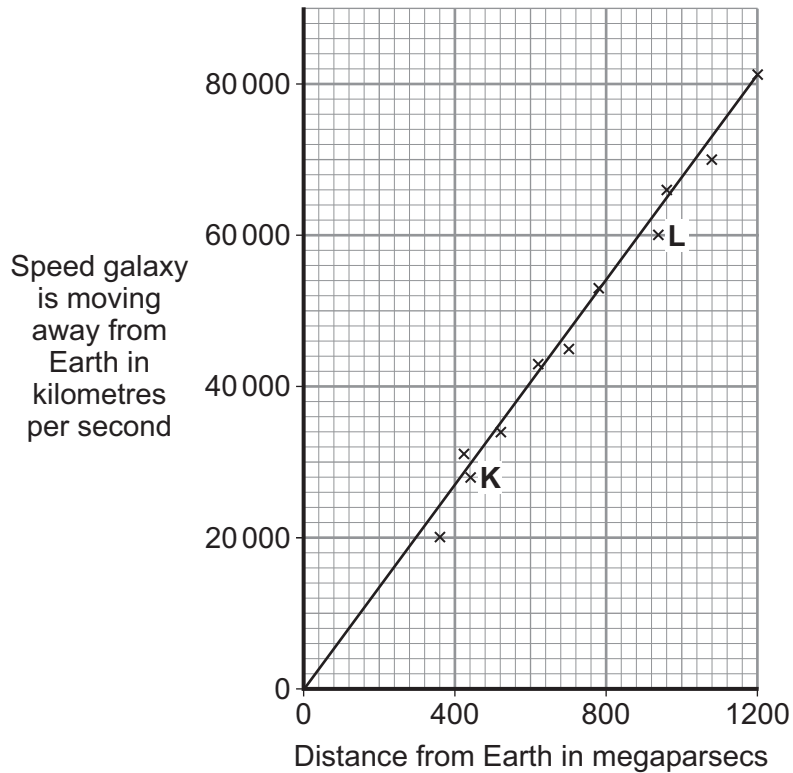
13



- 4 (a)** By measuring red-shift, astronomers are able to calculate the speeds at which galaxies are moving away from the Earth, and the distances of these galaxies from the Earth.

The graph shows some of the data calculated by astronomers. The data from two galaxies, **K** and **L**, is included in the graph.

$$1 \text{ megaparsec} = 3.09 \times 10^{19} \text{ km}$$



What can you conclude about the red-shift of galaxy **K** compared with galaxy **L**?

Explain your answer.

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(2 marks)



4 (b) State the Big Bang theory.

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(2 marks)

4 (c) The 'steady state' theory was once a popular alternative to the Big Bang theory.

The 'steady state' theory suggested that the universe, although expanding, had no origin and has always existed.

The 'steady state' theory was important in encouraging new research into the origin of the universe.

Suggest why it is important that scientists carry out new research.

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(1 mark)

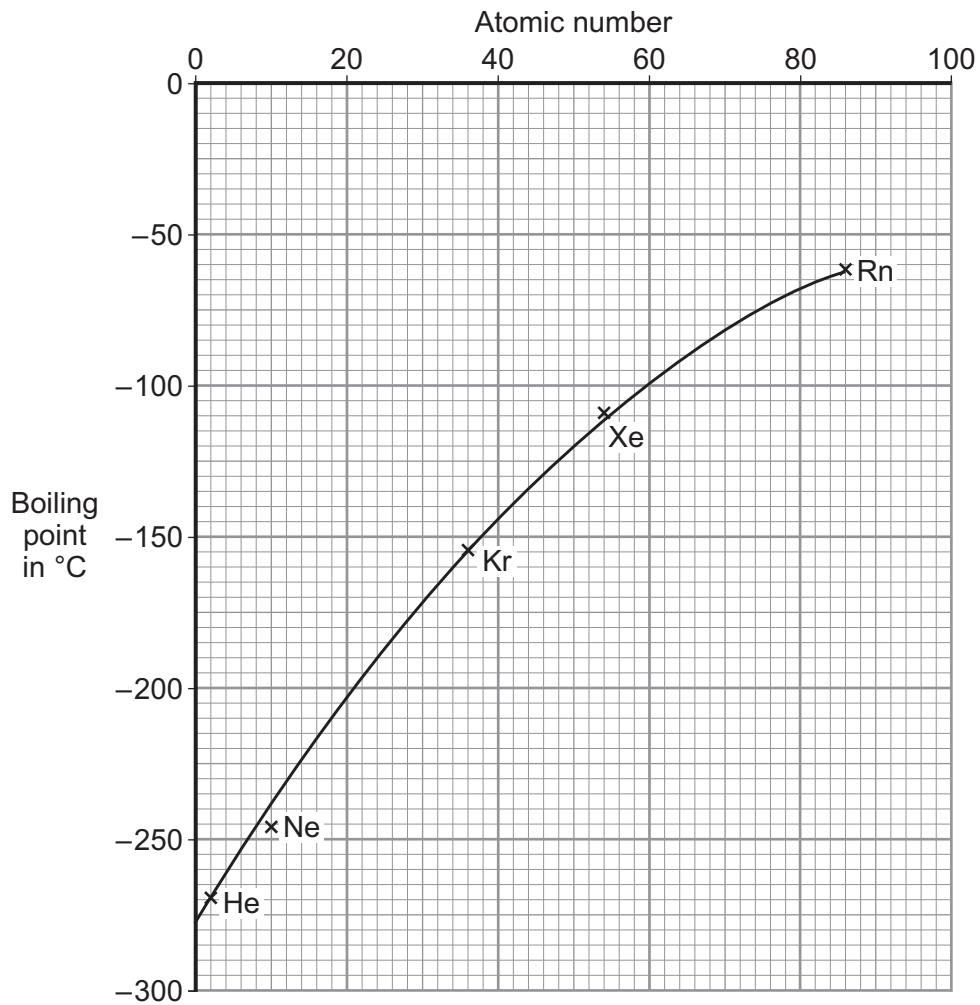
5

Turn over for the next question

Turn over ►



- 5 The graph shows the relationship between boiling point and atomic number for five gases, helium (He), neon (Ne), krypton (Kr), xenon (Xe) and radon (Rn).



- 5 (a) Describe the pattern shown in the graph.

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(2 marks)



5 (b) (i) Another gas, called argon, has an atomic number of 18.

How many electrons are there in an atom of argon?

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(1 mark)

5 (b) (ii) Give the electronic structure for argon. You may use a diagram to help your answer.

(1 mark)

5 (b) (iii) Use the graph to suggest the boiling point of argon.

Boiling point °C
(1 mark)

5 (c) (i) Name the process that is used to separate gases from air.

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(1 mark)

5 (c) (ii) Suggest why the air used in the process must be dry.

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(1 mark)

Question 5 continues on the next page

Turn over ►



5 (c) (iii) Describe how argon could be separated from air that has been liquefied at -225°C .

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(3 marks)

5 (c) (iv) Give **one** use for argon.

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(1 mark)

5 (d) The table gives information for two other gases, nitrogen (N_2) and oxygen (O_2).

Name	Atomic number	Boiling point in $^{\circ}\text{C}$
Nitrogen (N_2)	7	-196
Oxygen (O_2)	8	-183

Oxygen and nitrogen do **not** fit the pattern in the graph on page 10.

Suggest a reason why.

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(2 marks)



6 The photograph shows an animal called a gerenuk.



The gerenuk lives in very dry parts of East Africa, where there is very little food. The gerenuk has long legs, a long neck and is able to stand on its back legs. This means that it can eat leaves on bushes that other animals cannot reach.

6 (a) What is the name of the process by which gerenuks have evolved?

..... (1 mark)

6 (b) Explain how gerenuks' long necks evolved.

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(4 marks)

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Turn over ►



7 The Earth's early atmosphere is thought to have been mainly carbon dioxide, with little or no oxygen gas and some methane.

7 (a) What **three** other gases are also thought to have been present in the Earth's early atmosphere?

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(3 marks)

7 (b) *Methanogens* are bacteria which produce methane as a waste product. The methane often escapes into the atmosphere.

Prolonged exposure to oxygen kills *methanogens*.

7 (b) (i) Write down the formula of methane.

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(1 mark)

7 (b) (ii) Suggest why scientists think that *methanogens* were some of the first bacteria to evolve on the Earth.

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(1 mark)

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8 (a) Biomass is broken down by consumers to release energy.

Name this process and describe how the process may contribute to an increase in the concentration of greenhouse gases.

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(2 marks)

8 (b) Greenhouse gases in the Earth's atmosphere help to keep the Earth's surface warm enough to support life.

Explain how greenhouse gases keep the Earth's surface warm.

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(3 marks)

5

END OF QUESTIONS



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